

## CLAIMS:

1. A gas sensor module that is coupled to a gas conduit of a medical gas system in a healthcare facility and that operates to sense whether a type  
5 of gas in the gas conduit is a proper type of gas.
2. The gas sensor module of claim 1, wherein the module is located remotely from a set of source equipment of the medical gas system.
3. The gas sensor module of claim 1, wherein the module is mounted to the gas conduit behind a wall of the healthcare facility.
- 10 4. The gas sensor module of claim 1, wherein the module is mounted to the gas conduit above a ceiling of the healthcare facility.
5. The gas sensor module of claim 1, wherein the module is mounted to the gas conduit beneath a floor of the healthcare facility.
6. The gas sensor module of claim 1, wherein the module  
15 comprises a circuit including a gas sensor having a ceramic zirconia electrolyte material.
7. The gas sensor module of claim 1, wherein the module comprises a circuit including a gas sensor that senses a concentration of the gas based on an amount of time that ultrasonic sound waves propagate through a cavity  
20 containing a sample of gas from the gas conduit.
8. The gas sensor module of claim 1, wherein a sample of gas from the gas conduit flows through the module and exhausts to ambient atmosphere.
9. The gas sensor module of claim 1, wherein the module communicates an alarm signal to an alarm controller of a medical gas alarm system  
25 that monitors one or more conditions of the medical gas system.
10. The gas sensor module of claim 1, wherein the module activates an audible alarm when the gas type in the gas conduit is an improper type of gas.
11. A gas sensor module that is configured to couple to a service  
30 outlet of a medical gas system in a healthcare facility and that operates to sense whether a type of gas extant in a gas conduit coupled to the service outlet is a proper type of gas.

12. The gas sensor module of claim 11, wherein the module has a housing and a barrel extending from the housing, the barrel is configured for receipt in a port of the service outlet, and receipt of the barrel in the port opens a valve assembly of the service outlet to permit gas from the gas conduit to flow into the housing through the barrel.

13. The gas sensor module of claim 12, further comprising keys extending from the housing, the keys being configured for receipt in key-receiving apertures formed in the service outlet, and the valve assembly remaining closed during insertion of the barrel into the port of the service outlet until the keys are received in the key-receiving apertures.

14. The gas sensor module of claim 11, wherein gas from the gas conduit flows into the module through the service outlet and then exhausts to ambient atmosphere after flowing into contact with a gas sensor of the module.

15. The gas sensor module of claim 11, wherein the module comprises a housing, a circuit, and a test button that is coupled to the housing and that is pressed to test the circuit.

16. The gas sensor module of claim 11, wherein the module comprises a circuit including a light emitting diode that provides a visual indicator of an alarm condition that occurs when the type of gas in the gas conduit is an improper type of gas.

17. The gas sensor module of claim 11, wherein the module is configured to provide a feed-through service outlet to which an equipment connector is able to couple so that at least some of the gas flowing from the gas conduit into the module from the service outlet is thereafter able to flow out of the module and into the connector coupled to the module.

18. The gas sensor module of claim 17, wherein the module has a housing and a first barrel extending from the housing, the first barrel is configured for receipt in a first port of the service outlet, and receipt of the first barrel in the first port opens a first valve assembly of the service outlet to permit gas from the gas conduit to flow into the housing through the first barrel.

19. The gas sensor module of claim 18, wherein the feed-through service outlet comprises a second port formed in the housing, the connector has a second barrel configured for receipt in the second port, and receipt of the second

barrel in the second port opens a second valve assembly that is situated in the housing of the module to permit gas from the housing to flow into the connector through the second barrel.

20. The gas sensor module of claim 19, wherein the housing of the  
5 module is configured for keyed coupling to the service outlet and the connector is configured for keyed coupling to the housing of the module.

21. The gas sensor module of claim 11, wherein the module is configured for keyed coupling to the service outlet.

22. An integrated service outlet and gas sensor module coupled to a  
10 gas conduit of a medical gas system in a healthcare facility, the module being coupleable to a connector of a piece of equipment to provide gas from the gas conduit to the piece of equipment, and the module having circuitry that is operable to sense whether the gas from the gas conduit is a proper type of gas.

23. The integrated service outlet and gas sensor module of claim  
15 22, wherein the module comprises a housing having a port formed therein, the port is configured for receipt of a barrel of the connector, and receipt of the barrel of the connector in the port opens a valve assembly of the module to permit gas from the gas conduit to flow into the connector through the module.

24. The integrated service outlet and gas sensor module of claim  
20 23, wherein the housing has one or more key-receiving apertures formed therein and the one or more key-receiving apertures are configured for receipt of respective keys of the connector, and the valve assembly remains closed during insertion of the barrel into the port of the housing until the one or more keys are received in the respective key-receiving apertures.

25. The integrated service outlet and gas sensor module of claim  
25 22, wherein the module is configured for keyed coupling of the connector.

26. The integrated service outlet and gas sensor module of claim  
26 22, wherein the circuitry includes a gas sensor and the module includes a diverter that diverts some of the gas from the gas conduit to flow through the gas sensor and then  
30 exhaust to ambient atmosphere.

27. The integrated service outlet and gas sensor module of claim  
27 22, further comprising a test button that is pressed to test the circuitry.

28. The integrated service outlet and gas sensor module of claim 22, wherein the circuitry includes a light emitting diode that provides a visual indicator of an alarm condition that occurs when the type of gas in the gas in the gas conduit is an improper type of gas.

5 29. An apparatus for monitoring a gas extant in a gas pipe of a healthcare facility, the apparatus comprising

a housing;

a sensor carried by the housing and coupled pneumatically to the gas pipe, the sensor producing a sensor signal indicative of the type of gas extant in the  
10 gas pipe; and

a circuit carried by the housing and coupled electrically to the sensor, the circuit processing the sensor signal and producing an alarm signal if the gas extant in the gas pipe is an improper type of gas.

30. An apparatus for monitoring a gas that is available for delivery  
15 through a gas service outlet which is accessible in a room of a healthcare facility, the apparatus comprising

a gas sensor;

a circuit coupled to the gas sensor and operable to monitor the type of gas to which the gas sensor is exposed; and

20 a housing carrying the circuit and the gas sensor, the housing being adapted to be coupled to the service outlet.

31. The apparatus of claim 30, wherein the housing is adapted to be coupled to the medical equipment.

32. An apparatus for dispensing to healthcare equipment a gas from  
25 a gas pipe of a medical gas system of a healthcare facility and for monitoring the gas dispensed, the apparatus comprising

a gas sensor,

a circuit coupled to the gas sensor,

a housing carrying the circuit and the gas sensor, the housing being  
30 coupled to the gas pipe, the housing being configured for coupling of healthcare equipment thereto to receive gas from the gas pipe that passes through the housing, a sample of the gas from the gas pipe being diverted to the gas sensor so that the circuit is able to monitor the type of gas diverted to the gas sensor.

33. A gas sensor module that is adapted to be coupled to a line of a medical gas system that is designated for delivery of a type of gas, the gas sensor module being adapted to monitor the type of gas flowing through the line, to determine whether the type of gas flowing through the line is the proper gas type, and  
5 to generate an alarm signal if the gas type is improper.

34. A gas alert for a medical gas system, the gas alert comprising a main gas alarm module coupleable to a line adjacent a bulk supply of medical gas in a healthcare facility, the main gas alarm being adapted to sense whether the type of gas flowing through the line is the proper gas type, and  
10 at least one remote gas alarm module that is located remotely from the main gas alarm module and that receives communications from the main gas alarm module indicative of an alarm condition sensed by the main gas alarm module.

35. An oxygen concentration sensor module that is coupled to a gas conduit of a medical gas system in a healthcare facility and that operates to sense  
15 whether a concentration of oxygen in the gas conduit is within a predetermined range.

36. The oxygen concentration sensor module of claim 35, wherein the module is located remotely from a set of source equipment of the medical gas system.

37. The oxygen concentration sensor module of claim 35, wherein  
20 the module is mounted to the gas conduit behind a wall of the healthcare facility.

38. The oxygen concentration sensor module of claim 35, wherein the module is mounted to the gas conduit above a ceiling of the healthcare facility.

39. The oxygen concentration sensor module of claim 35, wherein the module is mounted to the gas conduit beneath a floor of the healthcare facility.

25 40. The oxygen concentration sensor module of claim 35, wherein the module comprises a circuit including an oxygen concentration sensor having a ceramic zirconia electrolyte material.

41. The oxygen concentration sensor module of claim 35, wherein the module comprises a circuit including an oxygen concentration sensor that senses a  
30 concentration of oxygen based on an amount of time that ultrasonic sound waves propagate through a cavity containing a sample of gas from the gas conduit.

42. The oxygen concentration sensor module of claim 35, wherein a sample of gas from the gas conduit flows through the module and exhausts to ambient atmosphere.

43. The oxygen concentration sensor module of claim 35, wherein  
5 the module communicates an alarm signal to an alarm controller of a medical gas alarm system that monitors one or more conditions of the medical gas system.

44. The oxygen concentration sensor module of claim 35, wherein the module activates an audible alarm when the concentration of oxygen in the gas conduit is outside the predetermined range.

10 45. An oxygen concentration sensor module that is configured to couple to a service outlet of a medical gas system in a healthcare facility and that operates to sense whether a concentration of oxygen in a gas extant in a gas conduit coupled to the service outlet is within a predetermined range.

46. The oxygen concentration sensor module of claim 45, wherein  
15 the module has a housing and a barrel extending from the housing, the barrel is configured for receipt in a port of the service outlet, and receipt of the barrel in the port opens a valve assembly of the service outlet to permit gas from the gas conduit to flow into the housing through the barrel.

47. The oxygen concentration sensor module of claim 46, further  
20 comprising keys extending from the housing, the keys being configured for receipt in key-receiving apertures formed in the service outlet, and the valve assembly remaining closed during insertion of the barrel into the port of the service outlet until the keys are received in the key-receiving apertures.

48. The oxygen concentration sensor module of claim 45, wherein  
25 gas from the gas conduit flows into the module through the service outlet and then exhausts to ambient atmosphere after flowing into contact with an oxygen concentration sensor of the module.

49. The oxygen concentration sensor module of claim 45, wherein  
30 the module comprises a housing, a circuit, and a test button that is coupled to the housing and that is pressed to test the circuit.

50. The oxygen concentration sensor module of claim 45, wherein the module comprises a circuit including a light emitting diode that provides a visual

indicator of an alarm condition that occurs when the concentration of oxygen in the gas in the gas conduit is outside the predetermined range.

51. The oxygen concentration sensor module of claim 45, wherein the module is configured to provide a feed-through service outlet to which an equipment connector is able to couple so that at least some of the gas flowing from the gas conduit into the module from the service outlet is thereafter able to flow out of the module and into the connector coupled to the module.

52. The oxygen concentration sensor module of claim 51, wherein the module has a housing and a first barrel extending from the housing, the first barrel is configured for receipt in a first port of the service outlet, and receipt of the first barrel in the first port opens a first valve assembly of the service outlet to permit gas from the gas conduit to flow into the housing through the first barrel.

53. The oxygen concentration sensor module of claim 52, wherein the feed-through service outlet comprises a second port formed in the housing, the connector has a second barrel configured for receipt in the second port, and receipt of the second barrel in the second port opens a second valve assembly that is situated in the housing of the module to permit gas from the housing to flow into the connector through the second barrel.

54. The oxygen concentration sensor module of claim 53, wherein the housing of the module is configured for keyed coupling to the service outlet and the connector is configured for keyed coupling to the housing of the module.

55. The oxygen concentration sensor module of claim 45, wherein the module is configured for keyed coupling to the service outlet.

56. An integrated service outlet and oxygen concentration sensor module coupled to a gas conduit of a medical gas system in a healthcare facility, the module being coupleable to a connector of a piece of equipment to provide gas to the piece of equipment, and the module having circuitry that is operable to sense whether a concentration of oxygen in the gas is within a predetermined range.

57. The integrated service outlet and oxygen concentration sensor module of claim 56, wherein the module comprises a housing having a port formed therein, the port is configured for receipt of a barrel of the connector, and receipt of the barrel of the connector in the port opens a valve assembly of the module to permit gas from the gas conduit to flow into the connector through the module.

58. The integrated service outlet and oxygen concentration sensor module of claim 57, wherein the housing has one or more key-receiving apertures formed therein and the one or more key-receiving apertures are configured for receipt of respective keys of the connector, and the valve assembly remains closed during  
5 insertion of the barrel into the port of the housing until the one or more keys are received in the respective key-receiving apertures.

59. The integrated service outlet and oxygen concentration sensor module of claim 56, wherein the module is configured for keyed coupling of the connector.

10 60. The integrated service outlet and oxygen concentration sensor module of claim 56, wherein the circuitry includes an oxygen concentration sensor and the module includes a diverter that diverts some of the gas from the gas conduit to flow through oxygen concentration sensor and then exhaust to ambient atmosphere.

15 61. The integrated service outlet and oxygen concentration sensor module of claim 56, further comprising a test button that is pressed to test the circuitry.

20 62. The integrated service outlet and oxygen concentration sensor module of claim 56, wherein the circuitry includes a light emitting diode that provides a visual indicator of an alarm condition that occurs when the concentration of oxygen in the gas in the gas conduit is outside the predetermined range.

63. An apparatus for monitoring an oxygen concentration of a gas extant in a gas pipe of a healthcare facility, the apparatus comprising  
a housing;  
an oxygen sensor carried by the housing and coupled pneumatically to  
25 the gas pipe, the oxygen sensor producing a sensor signal indicative of the oxygen concentration of the gas extant in the gas pipe; and  
a circuit carried by the housing and coupled electrically to the oxygen sensor, the circuit processing the sensor signal and producing an alarm signal if the oxygen concentration of the gas extant in the gas pipe is outside a predetermined  
30 amount.

64. An apparatus for monitoring an oxygen concentration of a gas that is available for delivery through a gas service outlet which is accessible in a room of a healthcare facility, the apparatus comprising



-56-

an oxygen concentration sensor;  
a circuit coupled to the oxygen concentration sensor and operable to  
monitor the oxygen concentration of the gas; and

a housing carrying the circuit and the oxygen concentration sensor, the  
5 housing being adapted to be coupled to the service outlet.

65. An apparatus for monitoring an oxygen concentration of a gas  
that is available for delivery through a gas service outlet which is accessible in a room  
of a healthcare facility for the coupling of medical equipment, the apparatus  
comprising

10 an oxygen concentration sensor;  
a circuit coupled to the oxygen concentration sensor and operable to  
monitor the oxygen concentration of the gas; and  
a housing carrying the circuit and the oxygen concentration sensor, the  
housing being adapted to be coupled to the service outlet, and the housing being  
15 adapted to be coupled to the medical equipment.

66. An apparatus for dispensing to healthcare equipment a gas from  
a gas pipe of a medical gas system of a healthcare facility and for monitoring the  
oxygen concentration of the gas dispensed, the apparatus comprising

an oxygen sensor,  
20 a circuit coupled to the oxygen sensor,  
a housing carrying the circuit and the oxygen sensor, the housing being  
coupled to the gas pipe, the housing being configured for coupling of healthcare  
equipment thereto to receive gas from the gas pipe that passes through the housing, a  
sample of the gas from the gas pipe being diverted to the oxygen sensor so that the  
25 circuit is able to monitor the oxygen concentration of the gas.